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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: P63423US0

US APPLICATION NO.(If known, see 37 CFR 1.5): 09/269723

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP97/04762	27 August 1997	1 October 1996

TITLE OF INVENTION: **COMPOSITE WEAR COMPONENT**

APPLICANT(S) FOR DO/EO/US: **Hubert FRANCOIS**

Applicant herein submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ■ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ■ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ■ A proper Demand for International Preliminary Examination was made by the 19th month from earliest claimed priority date.
5. ■ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ■ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ■ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ■ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ■ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ■ A translation of the annexes to the International Preliminary Examination report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet compliance with 37 CFR 3.28 and 3.31 is included.
13. ■ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ■ Other items or information:

    International Search Report — EPO
    PCT/IB/301 Form
    PCT/IB/304 Form
    PCT/IB/308 Form
    EPA/EPO/OEB Form 1001.1 — indicating *correct* priority date of 1 October 1996
    First Page of Publication
    International Preliminary Examination Report — with Annexes in French

U.S. APPLICATION NO.(If known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
	PCT/EP97/04762	P63423US0

17. ■ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
International preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (1)) $670.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (2)) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) $760.00		
Neither international preliminary examination fee (37 CFR 1.492 (a) (3)) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO) **$970.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (4)) and all claims satisfied provisions of PCT Article 33(2)-(4) $96.00		
Search Report prepared by the EPO or JPO (37 CFR 1.492 (a) (5)) . . . **$840.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 840.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ■ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 130.00	

Claims	Number Filed	Number Extra	Rate		
Total Claims	**11** -20 =	-0-	X $18.00	$	
Independent Claims	**2** -3 =	-0-	X $78.00	$	
Multiple dependent claim(s) (if applicable)			+ $260.00	$	
TOTAL OF ABOVE CALCULATIONS =				$ 970.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$ 970.00	
Processing fee of $130 for furnishing the English translation later the ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).					
TOTAL NATIONAL FEE =				$ 970.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00				$	
TOTAL FEES ENCLOSED =				$ 970.00	
				Amount to be refunded:	$
				charged:	$

a. ■ A check in the amount of $ 970.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. **06-1358** in the amount of $ --- to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ■ The Commissioner is hereby authorized to charge my account any additional fees set forth in §1.492 during the pendency of this application, or credit any overpayment to Deposit Account No. **06-1358** . A duplicate copy of this sheet is enclosed.

SEND ALL CORRESPONDENCE TO:
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By _____
John C. Holman
Reg. No. 22,769

P71A60 44787US0

Law Offices of

JACOBSON, PRICE, HOLMAN & STERN, PLLC

THE JENIFER BUILDING

400 SEVENTH STREET, N.W

WASHINGTON, D.C. 20004

Attny's Docket No. P63423US0

SMALL ENTITY DECLARATION
[37 CFR 1.9(c-f)]

Each undersigned declares that:

(1) ☒ the application attached hereto.

(2) ☐ U.S Application Serial No. _____, filed _____

(3) ☐ U.S. Patent No. _____ Issued _____
is entitled to the benefits of "small entity" status for paying reduced fees under 35 USC 41(a) and (b) to the Patent and Trademark Office by virtue of the following:

(4) ☒ Each undersigned declares that he/she qualifies as an independent inventor, or would qualify had he/she made the invention, as defined in 37 CFR 1.9(c).

(5) ☐ The undersigned declares that he/she is an official empowered to act on behalf of the concern identified below; that this concern qualifies as a small business concern as defined in 37 CFR 1.9(d); that exclusive rights to the invention have been conveyed to and remain with the small business concern, or if the rights are not exclusive, that all other rights belong to small entities as defined in 37 CFR 1.9.

(6) ☐ The undersigned declares that he/she is an official empowered to act on behalf of the organization identified below: that this organization qualifies as a nonprofit organization as defined in

(a) ☐ 37 CFR 1.9(e)(1)

(b) ☐ 37 CFR 1.9(e)(2)

(c) ☐ 37 CFR 1.9(e)(3)

(d) ☐ 37 CFR 1.9(e)(4) State law of _____;
that exclusive rights to the invention have been conveyed to and remain with the organization, or if the rights are not exclusive, that all other rights belong to organizations as defined in 37 CFR 1.9.

(7) Each person, concern or organization to which I/we have assigned, granted, conveyed or licensed, or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

(a) ☒ no such person, concern or organization

(b) ☐ persons, concerns or organizations listed below
[a separate declaration is required from <u>each</u> named person, concern or organization having rights to this invention averring to their status as "small entities."]

Full Name _____

Address _____

☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

I/we acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement of small entity prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b))

I/we hereby declare that all statements made herein of his/her own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application, any patent issued thereon, or any patent to which this declaration is directed.

(8) Hubert FRANCOIS	Hubert FRANCOIS	16 April 1999
Typed Name of Inventor	Signature	Date
Typed Name of Inventor	Signature	Date
Typed Name of Inventor	Signature	Date
Typed Name of Inventor	Signature	Date

(9) _____
Name of Small Business Concern or Nonprofit Organization

Typed Name	By Signature	Date

Title of Signatory

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Hubert FRANCOIS

Serial No.: New

Filed: Herewith

For: COMPOSITE WEAR COMPONENT

PRELIMINARY AMENDMENT TO LESSEN FEES

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE CLAIMS

Claim 4, lines 1-2, delete "any one of the preceding claims", insert --claim 1--;

Claim 5, lines 1-2, delete "any one of the preceding claims", insert --claim 1--;

Claim 6, lines 1-2, delete "any one of the preceding claims", insert --claim 1--;

Claim 7, lines 1-2, delete "any one of the preceding claims", insert --claim 1--;

Claim 10, lines 2-3, delete "any one of the preceding claims", insert --claim 1--.

REMARKS

The foregoing Preliminary Amendment is requested in order to delete the multiple dependent claims and avoid paying the multiple dependent claims fee.

Early action on the merits is respectfully requested.

Respectfully submitted,

JACOBSON, PRICE, HOLMAN & STERN, PLLC

By _____
John C. Holman
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Date: April 1, 1999
Atty. Docket: P63423US0
JCH:jrc

COMPOSITE WEAR COMPONENT

Subject of the invention

The present invention relates to a composite wear component produced by casting and consisting of a metal matrix whose wear face comprises inserts which have good wear resistance properties.

Technological background underlying the invention

The invention relates especially to wear components employed in plants for grinding, crushing and conveying various abrasive materials which are encountered in industries such as cement factories, mines, metallurgy, electricity generating stations or various quarries. These components are often subjected to high mechanical stresses in the bulk and to a high wear by abrasion at the working face. It is therefore desirable that these components should exhibit a high abrasion resistance and some ductility, to be able to withstand the mechanical stresses such as impacts and to be capable optionally of being machined.

Given that these two properties are difficult to reconcile with one another in the same material, composite components have already been proposed which have a core made of relatively ductile alloy in which isolated inserts which have a good wear resistance are embedded.

Document EP-A-0476496 proposes this technique for the production of grinding wheels whose working face has set-in inserts made of chrome pig iron.

Since it is known that ceramic materials have good abrasion resistance properties, it is also known to employ these materials for improving the abrasion resistance of wear components.

Document EP-A-0575685 proposes the use of ceramic materials in a moulding by lost-wax precision casting of small wear components.

This well-known process employs wax models which must be melted to obtain the mould cavity which must be filled with metal; this mould itself is made of ceramic and not of a conventional sand.

According to this document a ceramic pad (wafer core) is formed first, with a spongy structure which has a three-dimensional network of open pores all of which communicate with one another. This ceramic pad is formed by pouring grains of ceramic materials into an appropriate mould and, next, a liquid adhesive with a good fluidity, for example a liquid resin which, after curing, retains the grains to form the ceramic structure. The ceramic material may consist of aluminium oxide or of zirconium oxide. After having been pre-impregnated with wax, this pad is placed in a mould intended to produce the wax model of the component. The wax model is then cast and, lastly, the ceramic mould is produced by dipping the wax model in a ceramic slurry. The ceramic mould containing the wax model is then heated so as to melt the wax model. The wax thus flows from the ceramic mould but the pads inserted beforehand in the wax model remain adhesively bonded to the walls of the ceramic mould.

For the casting of metal in the ceramic mould the latter is preheated to a temperature of the order of 1150°C, generally under vacuum.

This known technique is limited, however, to lost-wax precision moulding. Moreover, the compatibility between the metal matrix and the ceramic structure, especially in terms of temperature behaviour, presents hardly any problems in the case of the applications mentioned in this document, given that, when the metal is being cast, the mould and the ceramic structure are preheated to a high temperature. In addition, the technique is limited to the production of very precise special components, which are sold at a very high price because the lost-wax moulding process itself is very costly.

The document "Ullmann's Encyclopedia of Industrial

Chemistry"(1985), W. Gerhartz, VCH Verslags-gesellschaft, 5th Edition XP002023826, page 5 mentions compositions based on Al_2O_3-ZrO_2 for grinding devices intended for conditioning cast products (billets and slabs).

Problems underlying the invention

The technique described above cannot as such be adapted to the manufacture of wear components of larger dimensions for applications such as those encountered in plants for grinding, crushing or conveying abrasive materials, where the components generally have sections of at least 25 mm and often larger than 40 mm.

In addition, in accordance with the technique of the present invention it is not possible to cast, or at least it is difficult to envisage casting, components with thin sections, for example of less than 25 mm, because neither the mould nor the ceramic insert is preheated to high temperature before the metal is cast.

Furthermore, the component usually undergoes a subsequent heat treatment. There must therefore be some compatibility from the viewpoint of temperature behaviour between the ceramic material and the metal, to avoid cracking due to the thermal shocks when liquid metal is being cast over the ceramic inserts, and those that can be produced during the subsequent heat treatment and caused by the different expansion coefficients of both these materials.

It is necessary, furthermore, that the mechanical properties of the ceramic material should be adapted to those of the metal in order to produce a component whose properties correspond to the requirements of the specific application for which it is intended.

The aim of the present invention is to provide a composite wear component with ceramic inserts satisfactorily corresponding to the requirements listed above.

A second problem arises from the fact that, above a thickness of 25 mm of the ceramic material, poor infiltration of the metal is observed. Another objective of the present invention is to solve this second problem by proposing specific geometries of the

composite wear component.

Main characteristic elements of the invention

To meet the first objective the invention proposes a composite wear component produced by conventional or centrifugal casting. It consists of a metal matrix whose wear surface comprises inserts which have good abrasion resistance properties, these inserts being made of a ceramic material, itself composite, consisting of a solid solution or homogeneous phase of 20 to 80 % of Al_2O_3 and 80 to 20 % of ZrO_2, the percentages being expressed by weights of constituents.

The ceramic material may additionally contain other oxides whose proportion by weight does not exceed 3 to 4 %.

According to a first preferred embodiment of the present invention the composition of the ceramic material is the following:
55-60 % by weight of Al_2O_3, and
38-42 % by weight of ZrO_2.

According to another preferred embodiment the composition of the ceramic material is the following:
70-77 % by weight of Al_2O_3, and
23-27 % by weight of ZrO_2.

The content of ceramic materials in the insert is between 35 and 80 % by weight, preferably between 40 and 60 % and advantageously of the order of 50 %.

This composite ceramic material is produced from an aggregate of ceramic grains which have a particle size within the range F6 to F22 according to the FEPA standard, that is to say a diameter of between approximately 0.7 mm and 5.5 mm. These ceramic grains are manufactured in a conventional way, by electrofusion, by sintering, by flame spraying or by any other process allowing the two constituents to fuse.

The ceramic grains are aggregated with the aid of an adhesive, the proportion of which does not exceed 4 % by weight relative to the total weight of the pad and is preferably between 2 and 3 % by weight. This

adhesive may be inorganic or organic. An adhesive based on a silicate or an adhesive which is in the form of epoxy resin may be mentioned by way of example.

The invention is based on the finding that aluminium oxide (corundum) and zirconium oxide have relatively different properties and this makes it possible, by a judicious choice within the abovementioned ranges, to adjust the hardness, the toughness and the thermal expansion coefficient of the ceramic composite so as to combine a good hardness and a good toughness; and to make it compatible with the precise application for which the component is intended, on the one hand, and to obtain, on the other hand, an expansion coefficient of the composite ceramic which is close to that of the casting metal chosen, that is to say of the pig iron or of the steel which has an expansion coefficient of between 10×10^{-6} and 11×10^{-6}.

Zirconium oxide has the advantage of having an expansion coefficient which is close to that of the metal. In addition, it contributes to good toughness, that is to say that it reduces the risks of breakage.

Aluminium oxide, for its part, contributes to good hardness. Within the pads the zirconium particles present in the alumina make it possible to increase the resistance of the latter to cracking and thus to obtain a toughness greater than that of each of the components considered in isolation, namely ZrO_2 or Al_2O_3.

In other words, in the wear components which are subjected to strong abrasion it is advantageous to increase the proportion of aluminium oxide, not exceeding, however, a certain limit beyond which the abrasion resistance and the toughness begin to decrease. In this case the second range is rather chosen for the ceramic composition.

On the other hand, in the case of the components which are subjected to considerable impacts or to high pressures, it is advantageous to give preference to the expansion coefficient at the expense of hardness and to increase the proportion of zirconium oxide in order to

decrease the stresses in the component and, consequently, the risks of breakage.

In the case of the components where there is a risk of cracking during the casting or during the subsequent heat treatment it is also advantageous to increase the proportion of zirconium oxide, to bring the expansion coefficient of the insert nearer to that of the metal matrix.

The choice of the proportions of the constituents of the composite ceramic insert may, of course, also take into account the composition of the casting metal with a view to the properties required by the application for which the component is intended. Similarly, the choice of the composition of the casting metal may be adapted to the nature of the composite insert.

Various geometries are proposed within the scope of the present invention in order to solve the problem of the poor infiltration of the liquid metal within the ceramic phase.

In the particular case where the thickness of the pad made of ceramic material becomes considerable, two or more superposed pads made of ceramic material will be proposed, according to a first embodiment, these being kept separated by a minimum gap of the order of 10 mm in order to permit the arrival of the liquid metal. This makes it possible thus to obtain correct infiltration of the various pads. In this way an appreciable increase in the proportion of the ceramic phase within the insert is obtained without being confronted with the problem of the poor infiltration by the metal.

According to another embodiment it will be proposed to produce the pad rather in the form of a "honeycomb" structure which includes various elementary cells exhibiting a polygonal or circular shape within the ceramic phase. The thickness of the walls of the various cells constituting the ceramic phase preferably varies between 5 and 25 mm.

Once again, this embodiment makes it possible to increase the quantity of the ceramic phase without, however, risking the problem of poor infiltration of the liquid metal in the case of a component whose wear takes place more particularly in depth.

Once again, the advantage lies in the fact that the walls do not exceed the limiting thickness for infiltration of the liquid metal, which is approximately 25 mm, but with a height that is practically equal to the height of the composite component. In addition, on proposing this second embodiment of the pad in the "honeycomb" form, the improvement in the grinding process is observed. In fact, after a certain period of service, hollow pits are created in the cellular metal part, which then fill with material to be ground and thus ensure that they play a part in self-protection against wear. This profile advantageously makes it possible to avoid the creation of preferential wear paths by the ground material, reflected in a drop in output rate in the case of the mills. It is noted, moreover, that this structure in the "honeycomb" form according to the second preferred embodiment makes it possible to reduce the risk of propagation of the cracks that could develop in the infiltrated pad during the production of the component. In fact, the splits which might be formed are then closed onto themselves and do not propagate within the whole component.

Brief description of the figures

Figure 1 describes a composite wear component according to a first preferred embodiment of the present invention.

Figure 2 describes a composite wear component according to a second embodiment of the present invention.

Figure 3 describes a particular application for a composite wear component according to the present invention.

Examples

Example 1 : Manufacture of an ejector for a crusher with a vertical shaft

A mixture of 75 % of Al_2O_3 and 23 % of ZrO_2 is made up, the two constituents of which are fused by electrofusion to form composite grains of a particle size included in the categories F6 to F20 of the FEPA standard. These grains are then poured into a mould of appropriate shape with a liquid adhesive which, after curing, holds the grains together to form a ceramic pad.

In this particular example it is recommended to employ the configuration shown in Figure 1, which takes two ceramic pads which are superposed and leaving a 10 mm gap between them. These pads are placed in an appropriate mould, preferably made of sand, into which is next cast a liquid pig iron including 3 % of carbon, 26 % of chromium and other conventional elements in a small proportion which is always encountered in alloys of this type. A wear component is thus produced with ceramic inserts with a hardness of the order of 1600 Hv with an expansion coefficient close to 8×10^{-6}, held in a pig iron matrix with a hardness close to 750 Hv.

Example 2 : Manufacture of a crusher rotor

The ceramic material is prepared as in Example 1 but this time choosing a composition which gives preference to the expansion coefficient at the expense of hardness, that is to say by taking 40 % of ZrO_2 and 60 % of Al_2O_3.

Given that the thickness is particularly considerable in this kind of component, a "honeycomb" form configuration is employed, as shown in Figure 2. In this case the structure is in the form of a "honeycomb" whose cells have walls the thickness of which is approximately 20 mm and the height of which is practically equal to the height of the composite component. This structure is produced with the aid of a manganese steel with a composition of 1 % of carbon, 14 % of

manganese and 1.5 % of molybdenum.

A composite component is thus produced with a hardness of approximately 1350 Hv with an expansion coefficient close to 9×10^{-6}. The objective here is to decrease the risk of splits in the component because of the high impact level to which this type of component is subjected.

Example 3 : Beater

Figure 3 shows an example of a ceramic pad employed for an application in beaters, which allows the three wear phases of the beater to be strengthened. The ceramic pad is a single component situated within the metal phase.

Amend

CLAIMS

1. Composite wear component produced by classical or centrifugal casting and consisting of a metal matrix whose working face or faces include inserts which have a very high wear resistance, characterized in that the inserts consist of a ceramic pad, this ceramic pad consisting of a homogeneous solid solution of 20 to 80 % of Al_2O_3 and 80 to 20 % of ZrO_2, the percentages being expressed by weights of the constituents, and the pad then being impregnated with a liquid metal during the casting.

2. Composite wear component according to Claim 1, characterized in that the ceramic material includes from 55 to 60 % by weight of Al_2O_3 and from 38 to 42 % by weight of ZrO_2.

3. Composite wear component according to Claim 1, characterized in that the ceramic material includes from 70 to 77 % by weight of Al_2O_3 and from 23 to 27 % by weight of ZrO_2.

4. Composite wear component according to any one of the preceding claims, characterized in that the content of ceramic materials in the insert is between 35 and 80 % by weight, preferably between 40 and 60 % and advantageously of the order of 50 %.

5. Composite wear component according to any one of the preceding claims, characterized in that the inserts consist of an aggregate of composite ceramic grains which have a particle size within the range F6 to F22 according to the FEPA standard.

6. Composite wear component according to any one of the preceding claims, characterized in that the ceramic grains are manufactured by electrofusion, by sintering, by flame spraying or any other process.

7. Composite wear component according to any one of the preceding claims, characterized in that the ceramic grains are joined integrally with the aid of an inorganic or organic liquid adhesive with a view to the production of the ceramic pad.

8. Composite wear component according to Claim 7,

characterized in that the pad does not contain more than 4 % of adhesive.

9. Composite wear component produced by casting and composed of a metal matrix including at least one ceramic pad, characterized in that at least two ceramic pads are placed side by side, leaving a gap of the order of 10 mm in order to permit the arrival of the liquid metal.

10. Composite wear component produced by classical or centrifugal casting according to any of the preceeding claims and made up of a metal matrix including a wear-resistant ceramic pad, characterized in that the ceramic pad is in the form of a honeycomb structure in which the various cells are of polygonal or circular shape within the ceramic phase.

11. Composite wear component according to Claim 10, characterized in that the thickness of the walls of the various cells constituting the ceramic phase varies from 5 to 25 mm.

ABSTRACT

Composite wear component produced by casting and consisting of a metal matrix whose working face or faces include inserts which have a very high wear resistance, characterized in that the inserts consist of a ceramic pad, this ceramic pad consisting of a homogeneous solid solution of 20 to 80 % of Al_2O_3 and 80 to 20 % of ZrO_2, the percentages being expressed by weights of the constituents, and the pad then being impregnated with a liquid metal during the casting.

Fig. 1

ABSTRACT

Composite wear component produced by casting and consisting of a metal matrix whose working face or faces include inserts which have a very high wear resistance, characterized in that the inserts consist of a ceramic pad, this ceramic pad consisting of a homogeneous solid solution of 20 to 80 % of Al_2O_3 and 80 to 20 % of ZrO_2, the percentages being expressed by weights of the constituents, and the pad then being impregnated with a liquid metal during the casting.

Fig. 1

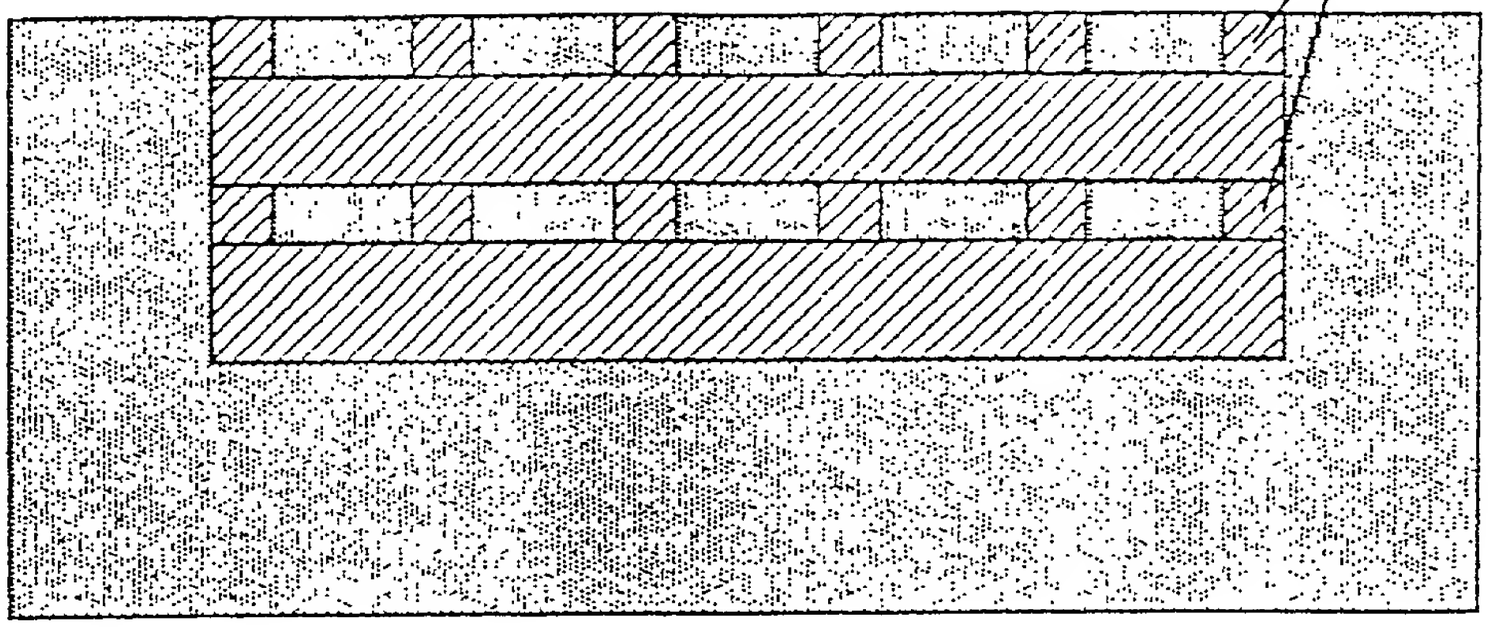

Fig 1.

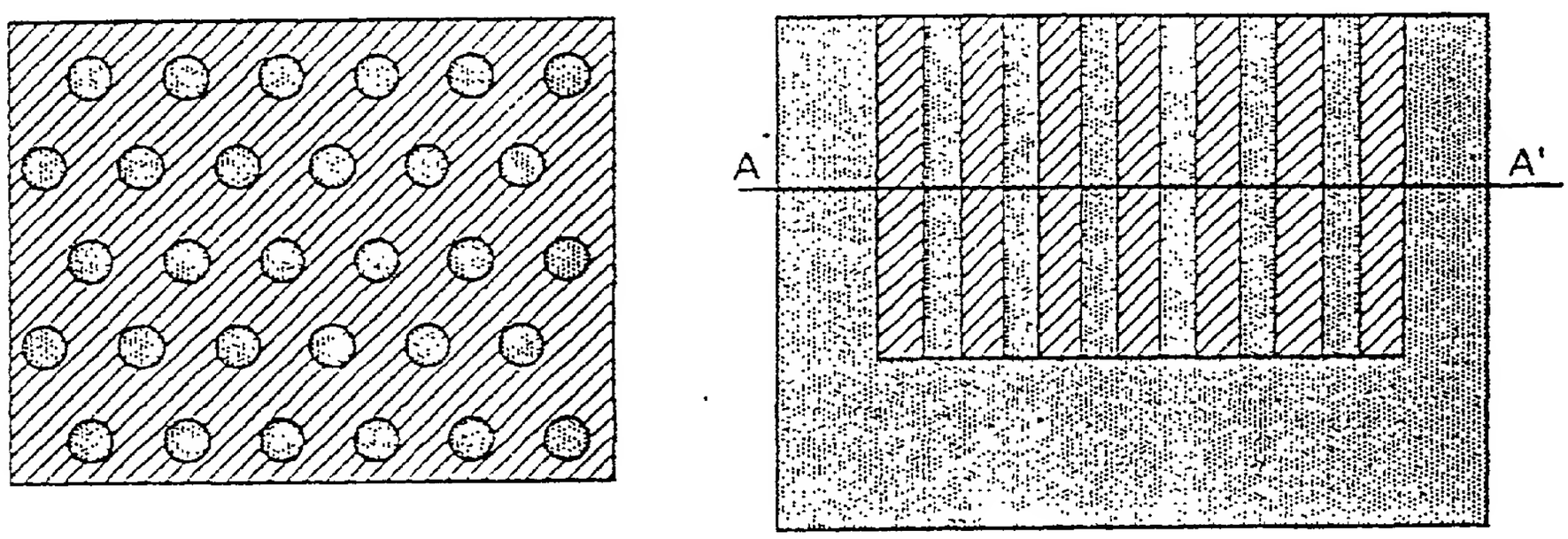

Fig 2.

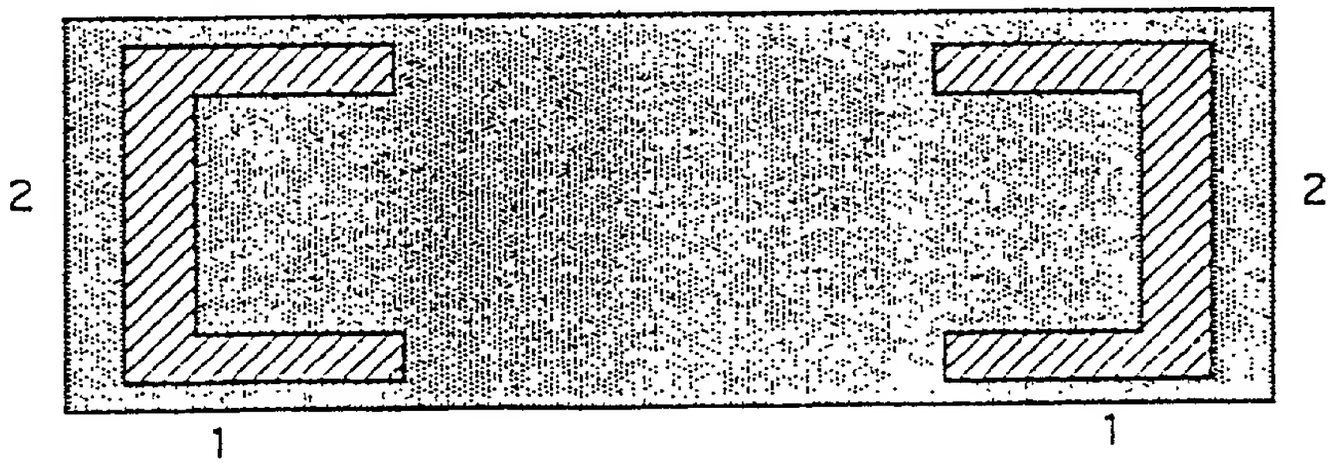

Fig. 3

Métal

Galette céramique infiltrée

PYA60 44187US0

DECLARATION AND POWER OF ATTORNEY U.S.A.

FOR ATTORNEYS' USE ONLY

ATTORNEYS' DOCKET NO. P63423US0

ALL PATENTS, INCLUDING DESIGN
FOR APPLICATION BASED ON PCT; PARIS CONVENTION,
NON PRIORITY, OR PROVISIONAL APPLICATIONS

As a below named inventor, I declare that my residence, post office address and citizenship are stated below next to my name, the information given herein is true, that I believe that I am the original, first and sole inventor (if only one name is listed at 201 below), or an original, first and joint inventor (if plural inventors are named below at 201-203, or on additional sheets attached hereto) of the subject matter which is claimed and for which patent is sought on the invention entitled

101 COMPOSITE WEAR COMPONENT

102 which is described and claimed in. ☒ PCT International Application No. PCT/EP97/04762 filed August 27, 1997

☐ the attached specification ☐ the specification in application Serial No _____ filed _____

(if applicable) and amended on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.
I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56
I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s) (Number)	(Country)	(Day/Month/Year Filed)	Priority Claimed
96202741.3	Europe	01/10/96	☒ Yes ☐ No
97870099.5	Europe	04/07/97	☒ Yes ☐ No
			☐ Yes ☐ No

103 104 I hereby claim the benefit under Title 35, United States Cod, §119(e) of any United States provisional appplication(s) listed below

Application No _____ Filing Date _____ Application No _____ Filing Date _____

105 I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application

(Application Serial No)	(Filing Date)	(Status patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys (Registration No.) to prosecute this application, receive and act on instructions from my agent, and transact all business in the Patent and Trademark Office connected therewith. HARVEY B. JACOBSON, JR. (20,851); D. DOUGLAS PRICE (24,514); JOHN CLARKE HOLMAN (22,769), MARVIN R. STERN (20,640); MICHAEL R. SLOBASKY (26,421); JONATHAN L. SCHERER (29, 851); IRWIN M. AISENBERG (19,007); WILLIAM E. PLAYER (31,409)

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*Inventor(s) name must include at least one unabbreviated first or middle name.

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I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code; and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201*	SIGNATURE OF INVENTOR 202*	SIGNATURE OF INVENTOR 203*
DATE 16th April 1999	DATE	DATE

☐ Additional inventors are named on separately numbered sheets attached hereto